



USGS Data Exploration Unit: Lesson 2 Activity Food Webs and Bioaccumulation

Introduction

In this activity you are going to analyze a food web to determine which organisms in the food web accumulate the greatest concentration of chemicals in their tissues and consider which organisms in a food web might be most affected by the introduction of a toxic chemical to their habitat. You will need to refer to your class notes to complete this activity.

When an animal consumes food having DDT residue, the DDT accumulates in the tissue of the animal by a process called **bioaccumulation**. The higher an animal is on the food chain (e.g. tertiary consumer such as seals), the greater the concentration of DDT in their body as a result of a process called **biomagnification**. In this activity you will identify the way in which DDT might move through a food chain.

Based on the food web relationships denoted by the arrows in the food web diagram, label each plant/animal with one of the following labels: primary producer, primary consumer, secondary consumer or tertiary consumer. Next rank the relative concentration of DDE in each plant/animal using the following scale: 1 = lowest concentration - 10 = highest concentration. Finally, answer the five questions following the food web diagram.

Questions

- 1) What is the difference between bioaccumulation and biomagnification?
- 2) Plants/animals from which of the following groups are most susceptible to problems from DDE: primary producer, primary consumer, secondary consumer or tertiary consumer. Why?
- 3) What are some differences between the food chain of ospreys and the food chain of northern harriers? How might these differences in the diet of osprey and northern harriers result in exposure to different amounts of DDE?

4)

a) Suppose an osprey eats 300 g of fish per day. The fish tissue consumed by the osprey has an average DDE concentration of $0.1\mu\text{g/g}$. How much DDE is the osprey consuming in one day?

b) Now suppose a bald eagle also eats 300 g of food per day. But, the bald eagle eats seal carcasses that have washed up on the beach. The seal had eaten fish-eating fish with $1.0\mu\text{g/g}$ DDE in their tissue. Much of the seal's body is made of blubber (a fatty substance) and the DDE bioaccumulates in the seal. So, the seal has $2.0\mu\text{g/g}$ DDE in its tissue. If the bald eagle eats 300 g of seal, how much DDE does the bald eagle consume in one day?

5) Taking all factors into account, rank the following for likelihood of bioaccumulation: bald eagles, osprey, seals, and northern harriers.